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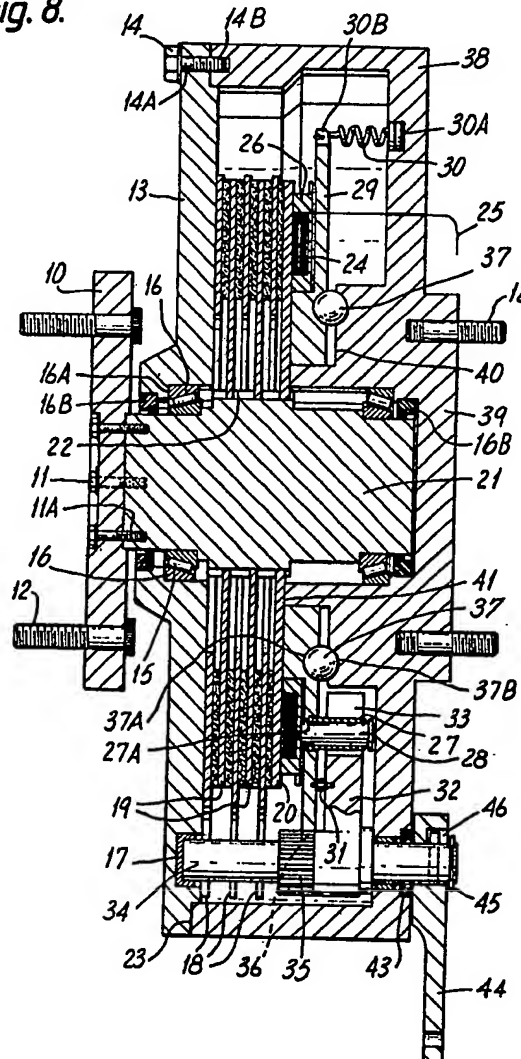
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(64) Disc brake assemblies

(67) The brake assembly has a brake housing 13, 38 and wheel shaft 21 rotatable in the housing. There is provided an armature plate 20 in the housing slidable on and rotatable with the shaft. Also provided is a movable actuator 29 in the housing movable rotatably and axially from an inoperative position to an operative position closer to the armature plate 20. An electromagnet 24 is provided either directly mounted (as shown) to

the movable actuator 29 or indirectly via a mechanical linkage (not shown). When the electromagnet 24 is energised it causes the actuator 29 to rotate through a small angle initially with the armature plate 20 and (e.g. by ball and ramp mechanism 37, A, B) to move axially to an operative position where it forces at least one stationary brake disc 18 and at least one rotatable brake disc 19 into engagement to achieve a braking action. This engagement is released upon de-energisation of the electromagnet.

Fig. 8.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

11/6

Fig. 1.

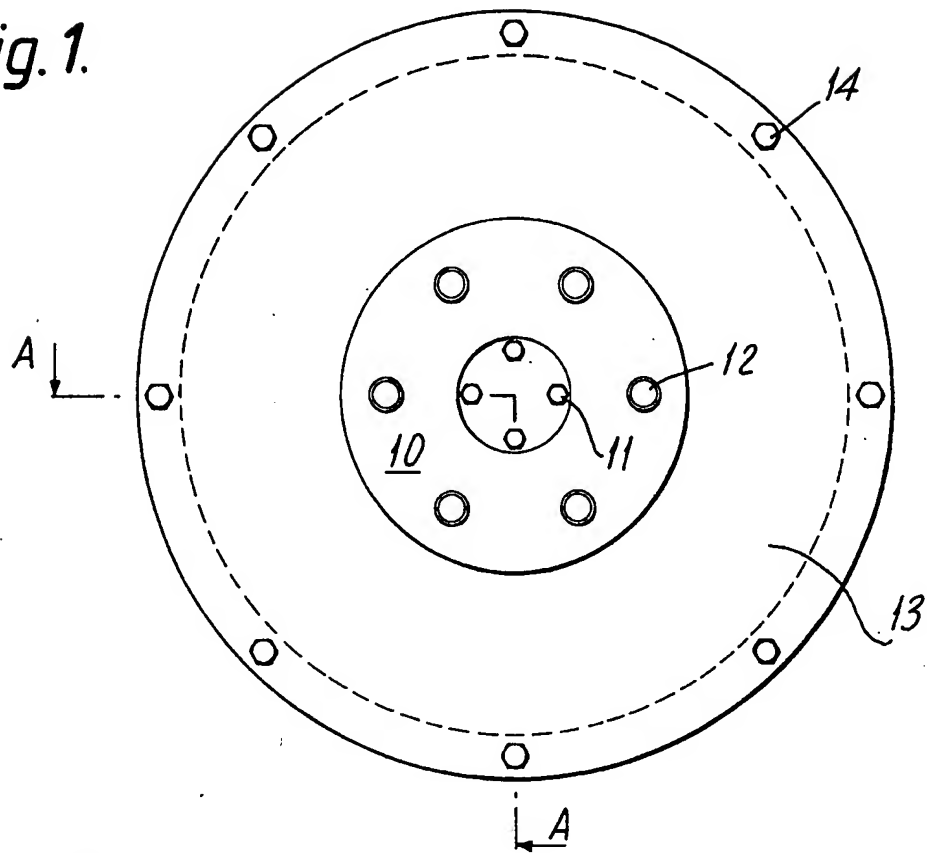
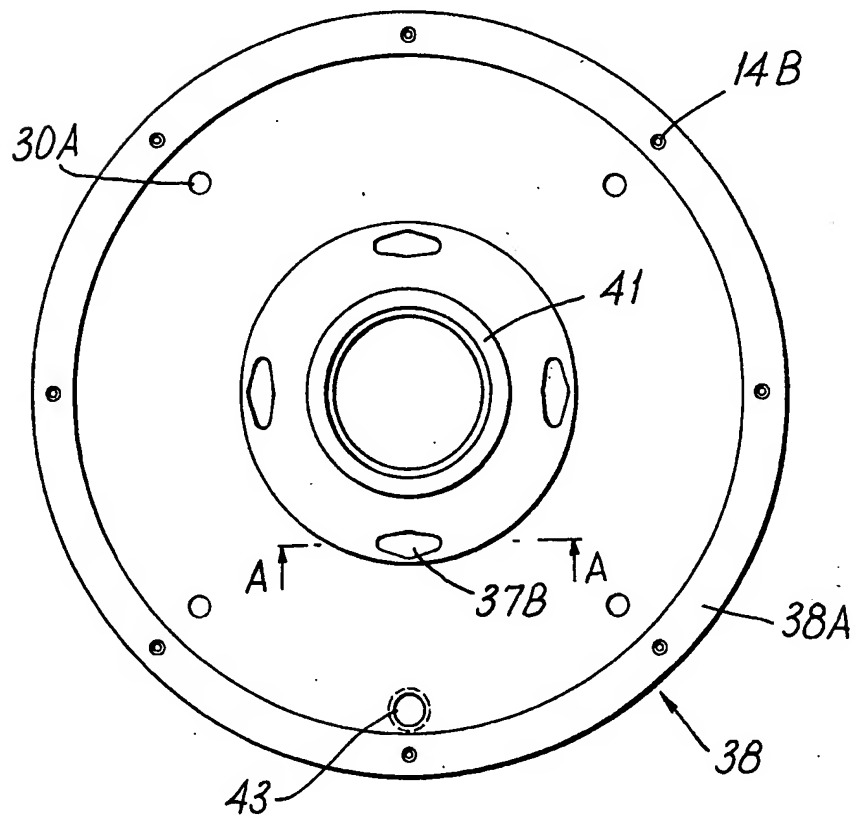
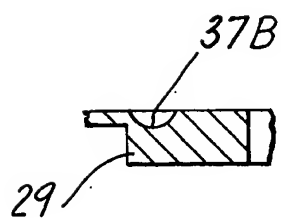
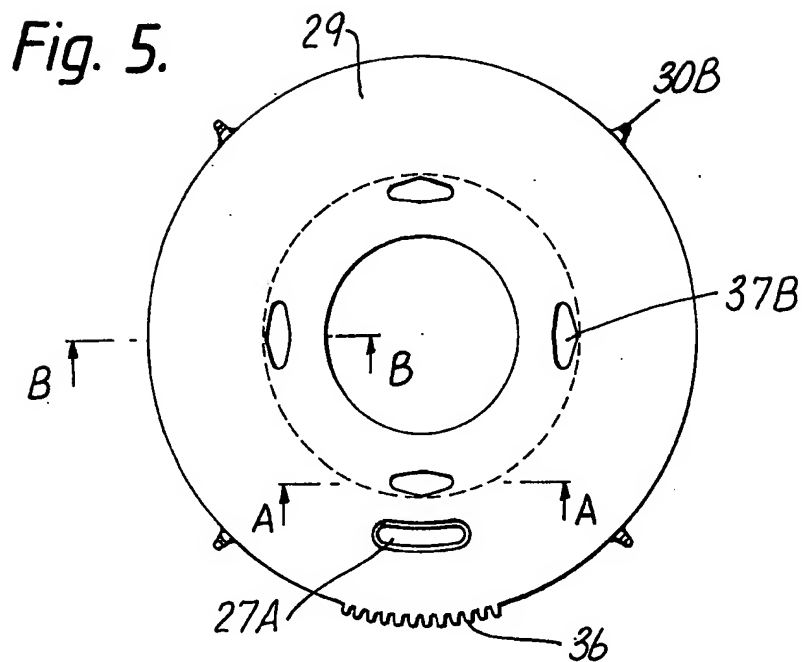
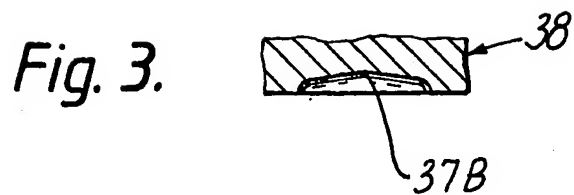
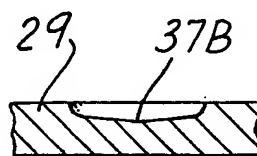


Fig. 2.





*Fig. 6.*



*Fig. 7.*

3/6

Fig. 4.

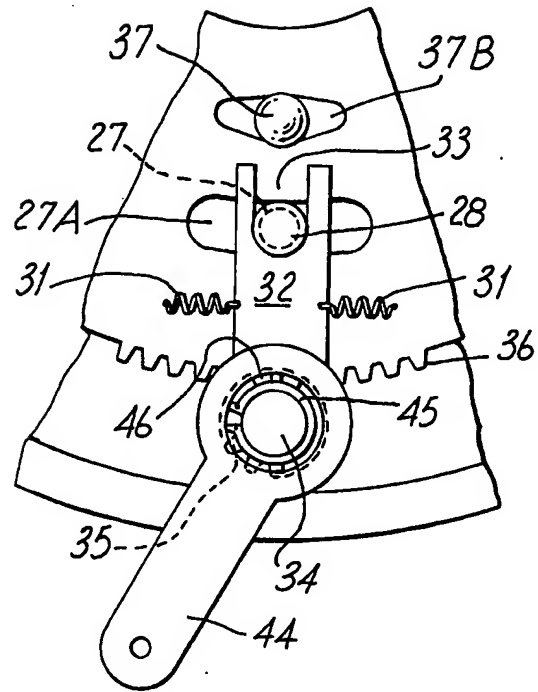


Fig. 10.

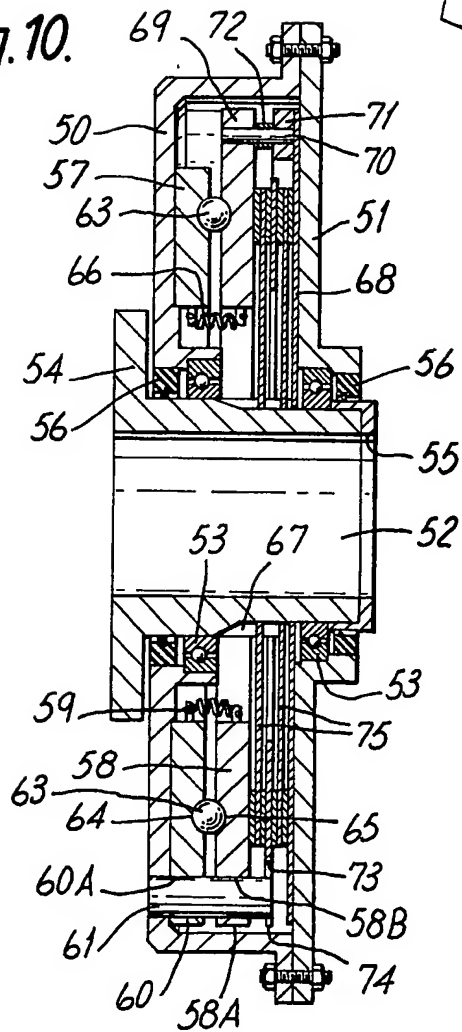
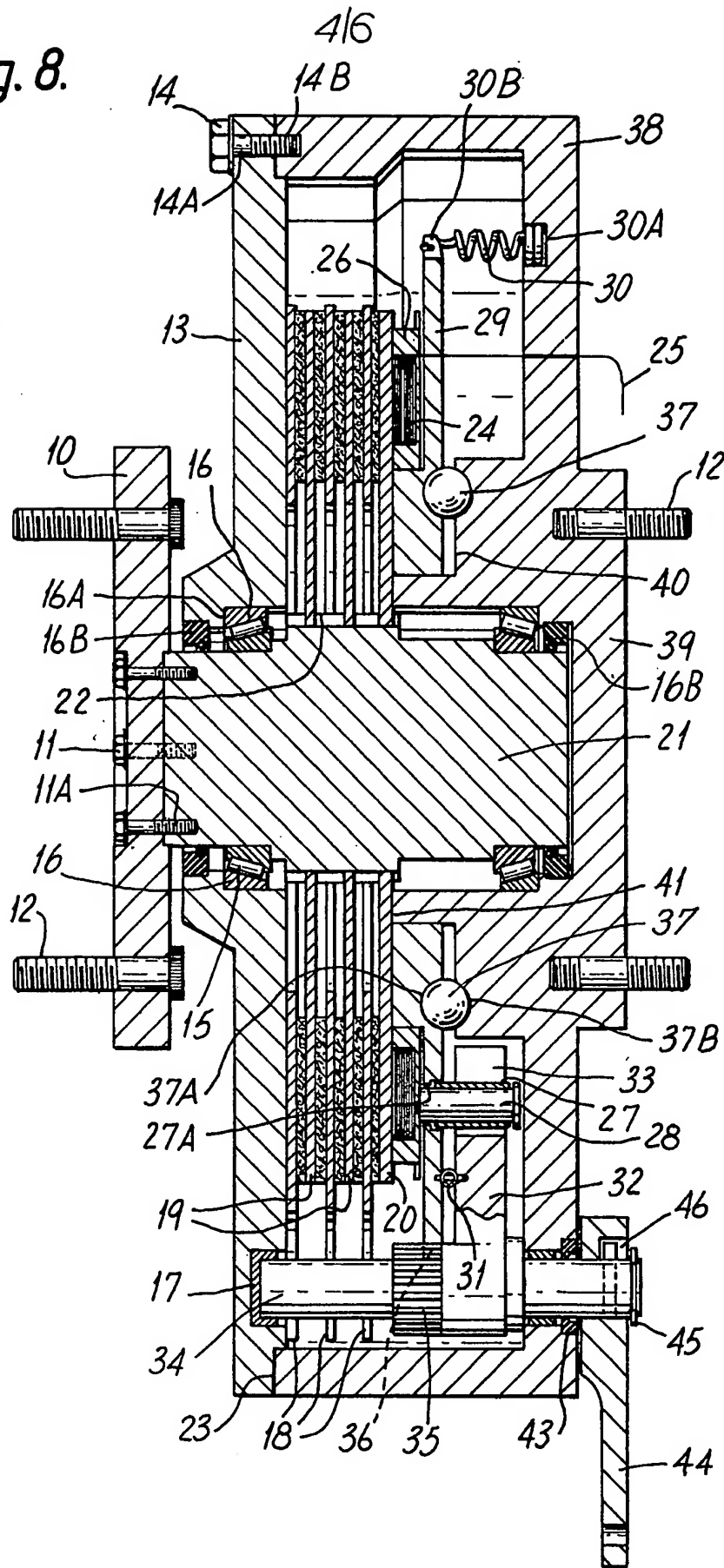


Fig. 8.



5/6

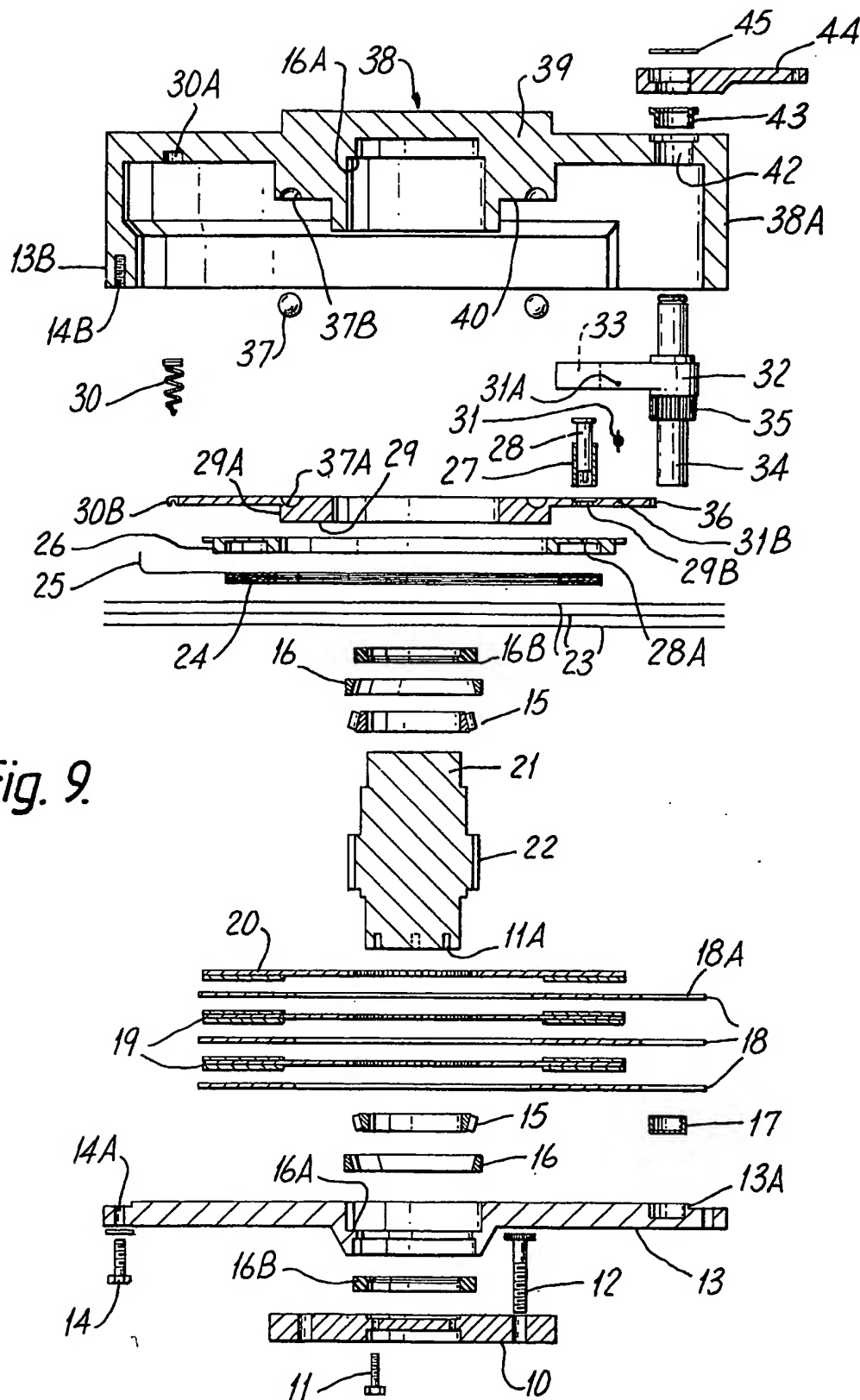
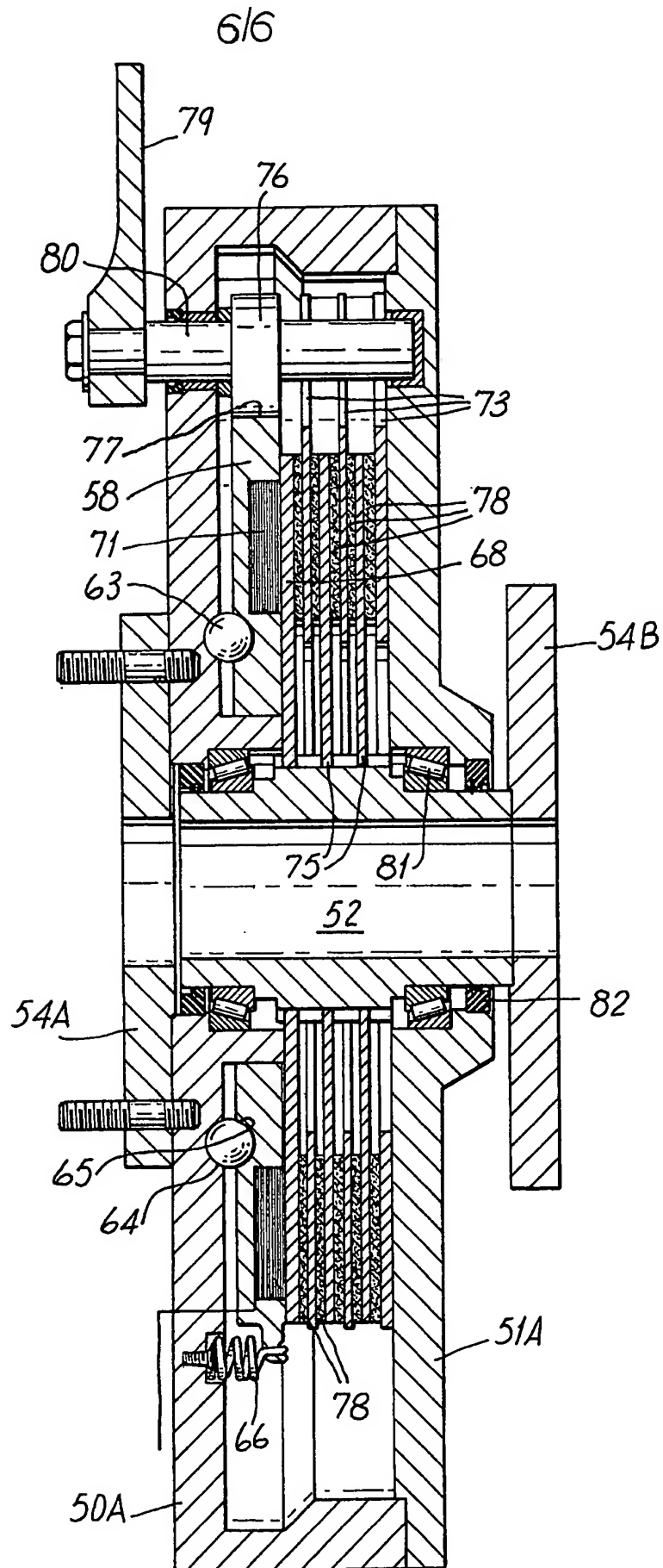


Fig. 11.



## SPECIFICATION

### Improved brakes

#### BACKGROUND OF THE INVENTION

##### (1) *Field of the Invention;*

5 This invention relates to improved brakes.

##### (2) *Description of the Prior Art:*

Conventional disc brakes comprising opposed actuator plates, steel balls movable in inclined ramps located in adjacent faces of the opposed actuator plates, rotating brake discs and non-rotatable stationary discs operate when a brake pedal connected by a linkage to the actuator plates to rotate relative to each other, which causes the steel balls to roll on the inclined ramps and thus push the actuator plates apart. This results in clamping the two sets of brake discs (i.e. stationary and rotatable) together to give a braking action.

However such conventional disc brakes have been found to be relatively disadvantageous in relation to uneven distribution of load when the stationary brake disc and the rotatable brake disc were clamped together which caused uneven wear on the brake linings. Also conventional disc brakes as described above tend to have the friction linings on the brake discs wearing out rather quickly with a need for consequential replacement.

Also when conventional disc brakes become well used, the steel balls will tend to wear a track in the ramps, and consequently increase the likelihood of the brakes jamming. One solution adopted to overcome this problem was the provision of raised lugs designed as wear bushings. Once the actuator plates were assembled inside a housing the lugs then fitted neatly in the housing. When the actuator plates are turned, the lugs then were designed to constantly assist in keeping the plates in the correct orientation (i.e. "true" or in line). The steel balls were also supposed to assist. However, it was found when the brakes became well used that the lugs were worn down and made a groove in the housing as well as the balls making a track in the ramps. Therefore eventually the friction discs jammed. Also the actuator plates jammed because they never seemed to remain parallel to each other and geometrically at right angles to their rotational plane at the same time. Thus the balls and lugs wore down after use, and the load stress points under rotation were concentrated in too small an area.

#### BRIEF SUMMARY OF THE INVENTION

It is an object of the invention to provide brakes which alleviate the above-mentioned problems.

Another object of the invention is to provide brakes which are particularly well suited to trailers or caravans, but are also applicable to other vehicles, the brakes being particularly efficient, self-adjusting, and not liable to damage due to ingress of water, dust or other foreign matter.

Accordingly, the invention provides a brake assembly including a brake housing; a wheel shaft

65 rotatable in the housing; an armature plate in the housing, secured to and rotatable with the shaft; a movable actuator in the housing movable rotatably from an inoperative position to an operative position closer to the armature plate; electromagnetic means adapted, when energised, to urge the actuator to rotate, with the armature plate, from inoperative to operative position; a rotatable brake disc in the housing, rotatable with the shaft; and a non-rotatable brake member in the housing; the actuator being adapted, when moved to operative position, to force the rotatable brake disc and the non-rotatable brake member into frictional contact to brake the rotation of the said disc and the shaft to which it is connected.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

In order that exemplary embodiments will now be understood, reference is now made to the accompanying drawings, wherein:

FIGURE 1 is a front view of the brake assembly in accordance with the invention;

FIGURE 2 is a front view of the rear housing component of the brake assembly of FIGURE 1; FIGURE 3 is a view along line A—A of FIGURE 2;

FIGURE 4 is a view of the actuating mechanism of the brake assembly of FIGURE 1 which moves the movable actuator from the inoperative to the operative position;

FIGURE 5 is a view of the movable actuator of the brake assembly of FIGURE 1;

FIGURE 6 is a view along line B—B of FIGURE 5;

FIGURE 7 is a view along line A—A of FIGURE 5;

FIGURE 8 is a side sectional view of the brake assembly of FIGURE 1;

FIGURES 9 is an exploded view of the brake assembly of FIGURE 1;

FIGURE 10 is a side sectional view of a modification of the brake assembly of FIGURE 8; and

FIGURE 11 is a side sectional view of another modification of the brake assembly of FIGURE 8.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings and in particular in FIGURE 9, the brake assembly of the invention includes wheel hub 10 which is attached to front brake assembly housing component or cover plate 13 by bolts 11. There is also provided wheel studs 12 which project outwardly through mating slots in wheel hub 10, and bolts 14 attaching cover plate 13 to the remainder of the brake housing. Bolts 14 fit through threaded holes 14A in cover plate 13.

Cover plate 13 also includes a shoulder or ledge 16A for accommodating bearing cone 16 and bearing cup 15. A seal 16B is also provided which locates on the front side of shoulder 16A as shown in FIGURE 9.

Cover plate 13 may be bolted to a rear housing

component 38 through bolts 14 which also engage in threaded holes 14B in component 38. In fact there is provided a peripheral flange 13A which engages with enlarged area 13B of peripheral flange 38A of rear housing component 38.

There is also provided bearing or bush 17, non-rotatable brake discs 18 which have a notch 18A to engage with a pin or appropriate part of the housing to prevent rotation, rotatable brake discs 19 having friction faces on both sides as shown, and a rotatable armature plate 20 having a frictional face or lining on its front face only as shown.

The brake assembly also includes a rotatable drive shaft 21 which is splined at 22 and threaded holes 11A for bolts 11 which interconnect shaft 21 with wheel hub 10. Another set of bearing cup 15 and bearing cone 16 is provided and also sealing gaskets 23.

There is also shown annular electromagnet 24

these recesses is elongated, its major axis being substantially tangential to a circle centred on the axis of the ring, is of arcuate cross-section, and diminishes in depth from the middle to both ends.

The two members 29 and 38, and their recesses, are such that when the movable ring 29 is at its median or inoperative position, each of the balls 37 is in the deeper middle parts of the two recesses 37A and 37B, and actuator ring 29 is fairly close to rear component 38; and when the movable actuator ring 29 is rotated to full extent in either direction, to either of its two operative positions, each of the balls 37 is rolled into shallow end parts of the two recesses 37A and 37B, and the actuator ring 29 is spaced furthest apart from housing component 38. The tension springs 30 interconnect the two members 29 and 38 and bias the movable ring 29 to its median or inoperative position.

The ferrous rotating armature plate 20 is made for engagement with the splines 22 of the shaft